

seventeen have both liquid and solid waste, and in the greater number of these the liquid waste preponderates.

But those industries selected by the author for special treatment are undoubtedly among the greatest sinners as regards possible river pollution. Their waste is, as a rule, particularly difficult to deal with, and a study of the means adopted in the several instances presents many features of interest to the sanitary and municipal engineer.

The work has been judiciously put together, and the examples of plant selected for special description are in all cases typical examples of their class. It is admirably printed and illustrated, and the diagrams and drawings are such as will commend themselves to the practical man. The work is specially addressed to borough engineers and surveyors, and we trust that it will be as widely read and studied by them as it deserves to be.

OUR BOOK SHELF.

Die Weltherrin und ihr Schatten. Ein Vortrag über Energie und Entropie. Von Dr. Felix Auerbach, Prof. a. d. Universität Jena. Pp. 56. (Jena: Gustav Fischer, 1902.) Price Mk. 1.20.

DR. AUERBACH no doubt undertook a very difficult task when he endeavoured to popularise the exact significance underlying the expressions "energy" and "entropy," and the relations subsisting between them, and it is not easy to say how far he has succeeded in making himself intelligible to an unscientific audience. Doubtless, of energy everyone believes himself to be more or less well informed, but of entropy, though perhaps not really more difficult of apprehension, yet from its less familiar use very great perplexity and uncertainty seem to exist. We can only hope that the author dissipated some of the clouds which hover around this intricate subject. The somewhat fanciful title of "The Mistress of the World and her Shadow" which is attached to the address leads one to expect a more picturesque and imaginative treatment than the subject receives. One looks naturally for a new set of metaphors and illustrations by which a rather dry subject may be illuminated and its treatment rendered more entertaining, but one does not find much that is new or very appropriate, though of course the matter is sound, and doubtless as a popular address the lecture was very effective.

We are glad to see that it has since been published in *Himmel und Erde*, where it is likely to meet with many and appreciative readers, and thus reach a wider audience than is possible in a lecture theatre. The authoritative version is accompanied by a short list of works connected with the general subject, and also some pages of explanatory notes from the professor addressed to those who are supposed to have some slight previous knowledge of the subject. Notes, attached in this way are usually a tacit admission on the part of the author that he has failed to accomplish the task that he has undertaken. We see no reason to view these notes in a different light.

Chemisch-Analytisches Praktikum. Von Dr. Karl Anton Henniger. Pp. viii + 127. (Brunswick: F. Vieweg und Sohn, 1902.) Price Mk. 1.50.

THE chief interest of this book lies in the fact that the author is head-master of the Charlottenburg Real Gymnasium, and that the course which he describes is the one adopted in that institution. We have thus an opportunity of seeing what kind of practical chemistry is cultivated in one of the first-class German schools. According to the author, the goal to be reached by the

great majority of his pupils is a knowledge of the chief reactions of the non-metals and metals, as well as sureness and clearness concerning the procedure of analysis and the use of the distinguishing reagents. This is to be effected by exercising in simple analysis.

If this be the case, it may be said that the book is well calculated to fulfil its purpose, for it is substantially a treatise on qualitative analysis prefaced by some useful exercises on different types of chemical action. Descriptions and equations are given for all the tests that are to be performed, and the pupil is, in fact, put through a regular analytical drill. The amount of detail is surprising considering that we are concerned with school-work, and it is difficult to see what would be left for the university to teach in the way of qualitative analysis if the students came with a mastery of this book.

It is remarkable that the course of chemistry here prescribed for school purposes is of the kind that, with pretty general approval, has been steadily disappearing from English schools during the past fifteen years. In this corner of education Germany can hardly be said to show the way.

A. S.

La Protezione degli Animali. By N. Licò. Pp. viii + 64. (Milan: U. Hoepli, 1902.)

THE appearance of this "booklet" may be taken as an indication that the proper treatment by man of the inferior animals and the avoidance of unnecessary and wilful cruelty are attracting attention in countries other than our own. Indeed, Turin, like Paris, possesses its own Society for the Protection of Animals, and the crusade against bearing-reins and other forms of minor torture is carried on as vigorously (and, shall we say, as vainly) as in London.

The author commences with a chapter on the duty of humanity to animals in general, and then proceeds to discuss the various groups of animals brought more especially into contact with man, and the cases where amendment in their treatment is most urgently required. In general, the arguments appear to be put temperately and moderately, even in regard to that thorny subject vivisection. Such sports as dog-racing (under the conditions in which it is conducted in some continental countries), cock-fighting and bull-fights the author unhesitatingly condemns. He is likewise averse to all mutilations of animals, whether to "improve" their appearance or for other reasons. But minor matters, such as the treatment of horses by cavalry soldiers and coachmen, and the nature and fitting of their accoutrements and harness, claim a share of attention. Whether the author will succeed in convincing the world that a vegetarian is preferable to an animal diet may be more than doubtful, but if the book leads to a diminution in any degree of certain forms of cruelty to animals from which this country at any rate is free, its publication will not have been in vain.

R. L.

Coal Cutting by Machinery in the United Kingdom. By Sydney F. Walker. Pp. 144. (London: The Colliery Guardian Co., Ltd., 1902.)

THE complaint has frequently been made against mine owners in this country that they are not availing themselves of coal-cutting machinery to anything like the same extent as mine owners in the United States. The complaint is justifiable, inasmuch as any methods by which labour and capital can economise are now absolutely necessary. In his excellent monograph on coal cutting by machinery, Mr. Walker shows that the question is by no means new to this country. The history of the coal cutter in Great Britain is an ancient one. Indeed, the earliest proposal to substitute the labour of a machine for that of a collier appears to have been made by Michael Menzies, of Newcastle-on-Tyne,

towards the end of the eighteenth century. The historical portion of the work shows the evolution of mechanical coal cutting in Great Britain since that date. Descriptions are given of every machine that has been put to practical use, as well as detailed particulars of those that are now in successful operation. The conclusions drawn by the author from his elaborate investigations are that the whole of the coal of Great Britain must be cut by machines, or the industry will find itself in much the same condition as the corn-growing industry, swamped by American production. The pillar and stall method of mining should be replaced by the long wall method, and coal-cutting machines would render blasting unnecessary. The most serious problem to be dealt with is that of cutting coal under a weak roof. The difficulties are perhaps hardly sufficiently emphasised by the author. In a tender coal the roof is crushed down on the machines, or supports have to be set near the faces. These get in the way of a machine. Moreover, machines are so noisy when at work that it is impossible to hear the preliminary warning sounds that the roof generally gives before it breaks down. Eventually, no doubt, it will be ascertained which machine can best be adapted to these conditions, or how the conditions can be modified to suit the machine that promises best.

The author's lucidly written and well illustrated volume cannot fail to prove of great value in directing the attention of mine owners to problems that, at the present time, are of the utmost importance.

Metallography: an Introduction to the Study of the Structure of Metals, chiefly by the Aid of the Microscope. By Arthur H. Hiorns. Pp. xiv + 158; with ninety-six illustrations. (London: Macmillan and Co., Ltd.; New York: The Macmillan Company, 1902.) Price 6s.

THE study of the properties and constitution of metals and alloys has made great progress during the last few years, and has reached a point when it can no longer be neglected by engineers. Steel workers have already received some guidance from the labours of metallographists, chiefly, perhaps, from investigations on what Osmond called the "pathology of metals," and the time may not be far distant when the microscope and the pyrometer will form part of the outfit required in the ordinary testing of materials. Metallography has been regularly taught for some time at many of the technical schools both in this country and in America, and it is remarkable that no text-book on the subject existed in the English language before the publication of the work under review. The researches on which Mr. Hiorns has based his book are scattered and highly specialised, and the acquirement of a general elementary knowledge of the subject has been a difficult matter for the student. The appearance of this book is, therefore, particularly well timed, and it will be eagerly read by many, who will not be disappointed by what they find.

The author has carefully collected most of the important results which have recently been obtained, and has given a terse and lucid summary of them which is surprisingly complete, considering the modest dimensions of the book. He has not devoted much effort to the philosophic aspect of the subject, but that is, perhaps, just as well, inasmuch as the science is in its infancy. With regard to the illustrations, exception may be taken to many of the photomicrographs, which appear to have been taken from a set of poor negatives. On the other hand, they have been beautifully reproduced on special paper. In the study of steel, the author has handicapped himself unnecessarily by using such low powers of magnification that some of the structures of which he speaks cannot be seen at all. Nevertheless, taking the book as a whole, Mr. Hiorns deserves the thanks of his fellow workers and teachers for the useful aid he has given them.

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LETTERS TO THE EDITOR.

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Notes on Young Gulls.

IN northern Bohemia there is a large pond or artificial lake—the Hirschberger Grossteich—with a small, rocky island. This is a favourite breeding-place of gulls. Most of these are *Larus ridibundus*, but some *Sterna hircundo* also breed on the rock. For the purpose of studying its plankton I have repeatedly visited this pond, and have thus had occasion also to make some observations on the gulls which may perhaps be of interest to readers of NATURE.

The rock island which forms the breeding-place is some 400 square metres in extent, and rises in ledges to a height of 15 metres. It is composed of the Cretaceous "Quadersandstein" of those parts, partly bare and partly covered with patches of tough, greenish-brown grass and brighter green thistles. The *Larus ridibundus* nests on this rock are pretty carefully built and entirely composed of dry leaves of bulrushes. There are generally three eggs in each nest. At the height of the breeding season there are about 200 such nests on the rock, besides the much less numerous *Sterna* nests. The nests usually lie on the bare rock close to the margin of a patch of vegetation. The dirty brownish-yellow and black-spotted, mimetic colouring of the down-covering of the young is very effective. When from two to ten days old these young crouch, on being disturbed, against the half-dry grass-tufts and thistles close to their nest, and are then by no means easy to detect. It seems to me that the colouring of these young gulls is not quite the same as that in young of the same species breeding in different environments. It is quite likely that we have here a case of adaptation of the colour of the young to different surroundings, unaccompanied by any difference in the colouring of the adult into which they develop. Older ones, which are already beginning to replace the down with feathers, but in which the head is still entirely covered by the primitive yellowish-brown and black down, do not, as a rule, try to hide themselves in this way, but hurl themselves into the water and swim away rapidly when the boat approaches the rock. The old birds scream loudly and try, first, to entice the intruder away in the usual manner by slowly swimming and flying about near the boat and pretending to be wounded and lame. Besides this, however, they also swoop down on the swimming young, sometimes pushing them right under the water. The first of these actions clearly tends to draw the attention of the intruder away from the young; the second has the very opposite effect. Perhaps it may be accounted for in this way. The young have—this can be observed clearly enough—no idea of the nature of the movements of a boat, and often try to escape it by swimming straight ahead in front of the bow. It gives the impression that the old birds try by their screams to convey instructions to the young about the direction in which they should swim so as better to escape the boat. The young, however, often appear not to understand or to heed these "words of advice," whereupon the old birds pounce down on them and give them one or two good slaps with their wings so as to make them understand and obey. These sharp lessons do not seem to be of much good, however. After being thus slapped, the young continue to swim straight ahead of the boat as stupidly as before.

One of the eggs I brought home and hatched artificially. The bird began to chirp in the egg a few days after I had placed it in the oven, upon which I cut away the blunt end of the eggshell and found, as was natural after hearing the bird give voice, the beak protruding into the air-chamber. On the fourth day after this the young gull left the egg-shell. It then weighed 22.7 gr. We weighed it daily for a fortnight. The average daily gain of weight during this time was 8.5 gr.

The daily increments were quite irregular, varying between 1.6 and 3.2 gr. the first four days, and between 5 and 27.5 gr. the latter ten days. These irregularities were, of course, due to differences in the quantity of the contents of the intestine. One day—not three, as has been stated by Prof. Thomson (NATURE, vol. lxiv. p. 588)—after birth the young bird swam about when placed in water just as well as a young duck. For